GCST

2.1.3
THINKING PROCEDURALLY
TOPIC WISE EXAM QUESTIONS

A-LEVEL OCR

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SPEC

2.1.3 Thinking procedurally	a) Identify the components of a problem. b) Identify the components of a solution to a problem. c) Determine the order of the steps needed to solve a problem. d) Identify sub-procedures necessary to solve a problem.	Candidates need to be able to deconstruct a program and identify its component parts, for example listing the parts or completing a structure chart. Candidates may be given some component parts and be asked to add to, or complete these from a written description of pseudocode code for a program. Candidates need to be able to identify the steps that will take place to complete an algorithm, or program, and be able to write these in a suitable format (such as a flowchart or pseudocode), and put a given list into the correct order to produce a working program. Candidates may need to write pseudocode, code, or draw a flowchart to show a sequence of steps. Candidates need to understand the use and purpose of sub-procedures in a program. They need to be able to identify where sub-procedures may be used, and write appropriate pseudocode, code and/or flowchart(s) for these sub-procedures, making use of parameters where appropriate. Candidates may be given a structure diagram that they will need to interpret, or complete, to identify these sub-procedures.

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2023

8 A program is being designed that will allow a user to log into an account on a website using a username and password.

(b) Identify **two** possible sub-procedures that could be used in this program.

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2 .....

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[2]

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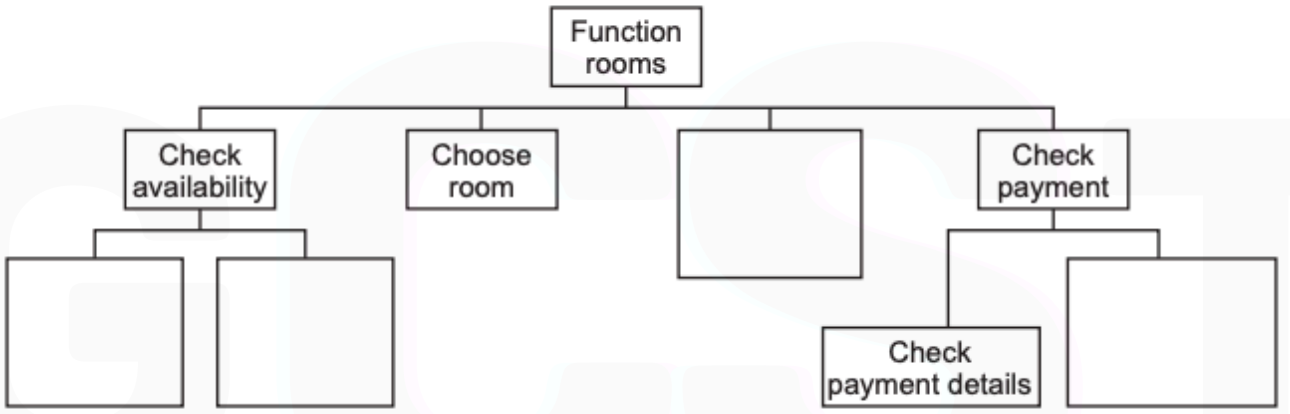
2022

AS - Level

1 Ruhail owns ten different function rooms which can be hired by different business customers to hold meetings. He would like a program to manage the booking process of each room.

Customers should be able to enter the date they want to hire a function room, and then a list of available rooms will be displayed. Customers can then select which room they want to hire. Customers can then enter their payment details which are then checked and then a confirmation email is sent to the customer.

(a) Complete the structure diagram below to show the different component parts of the problem.



[4]

2 Logan is writing a program for his customers to be able to buy his gym equipment. In the program, once a customer has selected the items they want to buy, a procedure, `checkDetails`, will be called. This procedure will check that the customer has input their telephone number and also check that it is at least 11 characters long.

(a) Logan has written two possible versions of the procedure that could be used to achieve this.

Version One:

```
procedure checkDetails()
      telephoneNo = input("Enter telephone number")
      while (telephoneNo == "") or (telephoneNo.length < 11)
            print("Error, please try again")
            telephoneNo = input("Enter telephone number")
      endwhile
endprocedure
```

Version Two:

```
procedure checkDetails()
      telephoneNo = input("Enter telephone number")
      if (telephoneNo == "") or (telephoneNo.length < 11) then
            print("Error, please try again")
            telephoneNo = input("Enter telephone number")
      endif
endprocedure
```

(ii) As well as the procedure `checkDetails`, Logan would like to use additional procedures to expand his program.

The program will be expanded to:

- allow customers to be able to register an account by setting up a username and password
- allow registered users to be able to log-in with their registration details
- allow customers, once logged in, to be able to add items that are in stock to their online shopping basket.

State **two** other procedures that Logan could write to meet these requirements, and for each one, state a suitable name and purpose.

Procedure 1:

Procedure Name: .....

Purpose: .....

.....

Procedure 2:

Procedure Name: .....

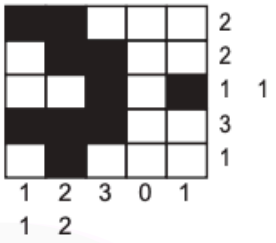
Purpose: .....

.....

[4]

8 A Nonogram is a logic puzzle where a player needs to colour in boxes. The puzzle is laid out as a grid and each square needs to be either coloured black or left white.

The numbers at the side of each row and column tells the player how many of the boxes are coloured in consecutively. Where a row has two or more numbers, there must be a white square between the coloured squares.



In this example:

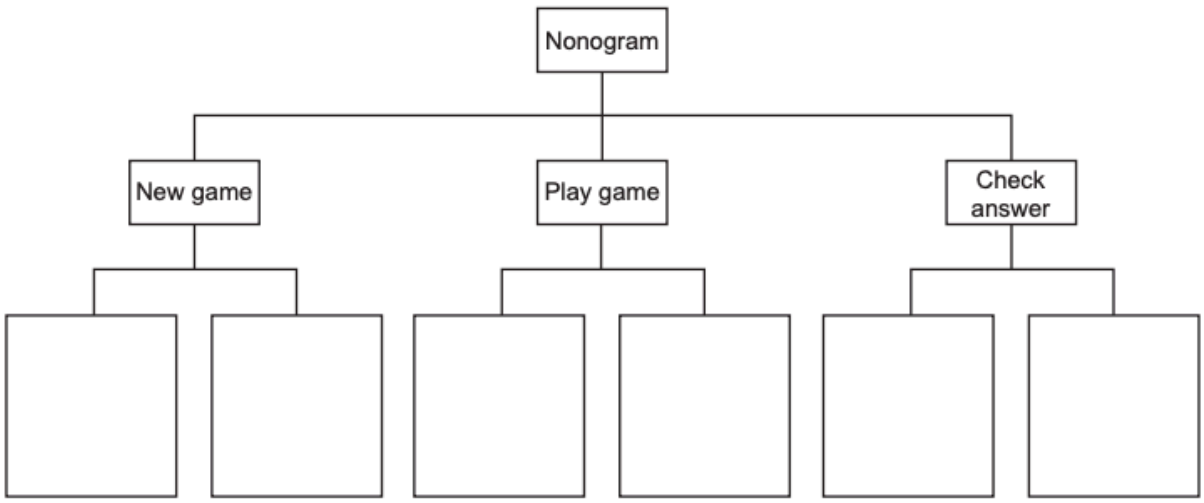
- the first column has 1 1, this means there must be two single coloured boxes in this column. There must be at least 1 white box between them.
- the first row has 2, this means there must be two consecutively coloured boxes in the row.

Juan is creating a program that will store a series of Nonograms for a user to play. The game will randomly select a puzzle and display the blank grid with the numbers for each row and column to the user.

The user plays the game by selecting a box to change its colour. If the box is white it will change to black and if it is black it will change to white. The user can choose to check the answer at any point, and the game will compare the grid to the answers and tell the user if they have got it correct or not.

(a) Juan is creating a structure diagram to design the game.

(i) Complete the structure diagram by adding another layer for New game, Play game and Check answer.



[3]

(ii) A structure diagram is one method of showing the decomposition of a problem.

Explain why decomposing a problem can help a developer design a solution.

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[2]

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4 Mabel is a software engineer. She is writing a computer game for a client. In the game the main character has to avoid their enemies. This becomes more difficult as the levels of the game increase.

(b) The computer game allows a user to select a character (e.g. name, gender). They can then choose a level for the game (easy, normal, challenging). The user controls their character by moving it left or right. The character can jump using space bar as an input. If the character touches one of the enemies then it loses a life. The character has to make it to the end of the level without losing all their lives.

The game is designed in a modular way.

(i) One sub-procedure will handle the user input.

Describe **three** other sub-procedures Mabel could create for the given game description.

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3 .....

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[6]

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2017

3 An encryption routine reads a line of text from a file, reverses the order of the characters in the string and subtracts 10 from the ASCII value of each letter, then saves the new string into the same file.

The program is split into sub-procedures. Three sub-procedures are described as follows:

- Read string from file
- Push each character of the string onto a stack
- Read and encrypt each character message

(a) (i) Identify **one** further sub-procedure that could be used in the program.

..... **[1]**

(ii) Describe **two** advantages of splitting the problem into sub-procedures.

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[4]

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6 A software developer is creating a Virtual Pet game.

The user can choose the type of animal they would like as their pet, give it a name and then they are responsible for caring for that animal. The user will need to feed, play with, and educate their pet.

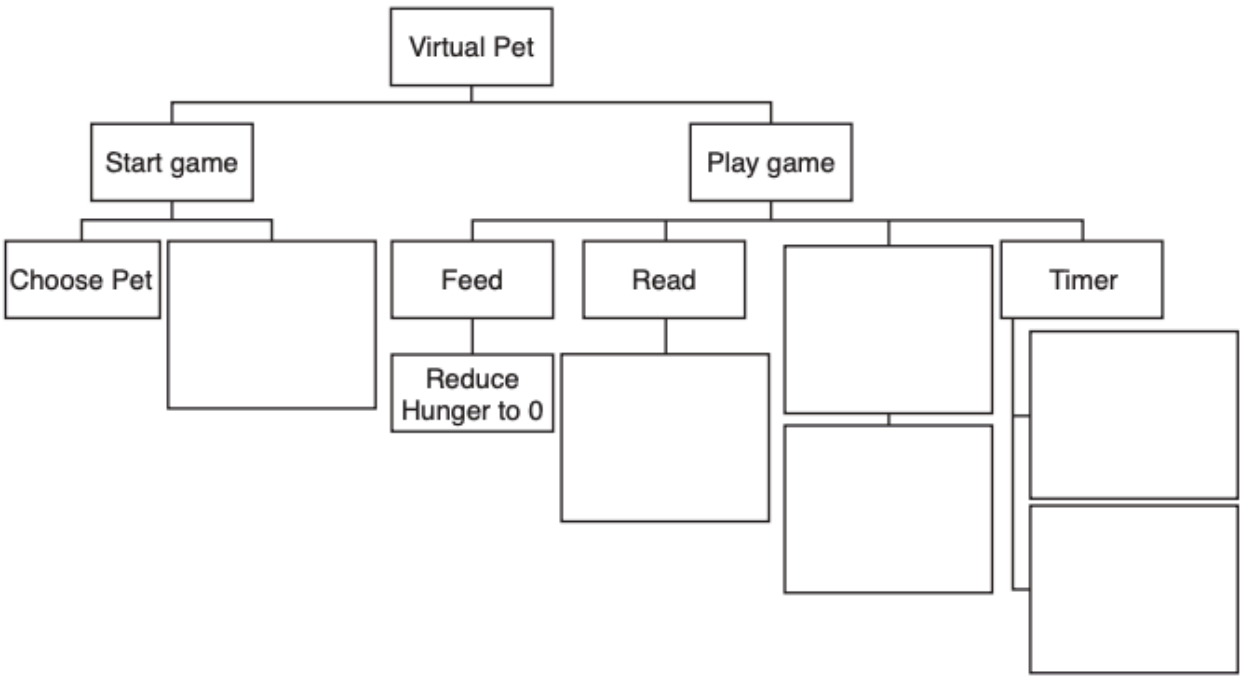
The aim is to keep the animal alive and happy, for example if the animal is not fed over a set period of time then the pet will die.

- The game tells the user how hungry or bored the animal is as a percentage (%) and the animal's intelligence is ranked as a number between 0 and 150 (inclusive).
- Hunger and boredom increase by 1% with every tick of a timer.
- When the feed option is selected, hunger is reduced to 0.
- When the play option is selected, bored is reduced to 0.
- When the read option is selected, the intelligence is increased by 0.6% of its current value.

An example of the game is shown:

```
What type of pet would you like? Fox or Elephant?
Fox
What would you like to name your Fox?
Joanne
Joanne's stats are
Hunger: 56%
Bored: 85%
Intelligence: 20
What would you like to do with your pet? Play, Read or Feed?
```

(ii) The developer has produced the following structure diagram for the game:



Complete the structure diagram for the Virtual Pet game by filling in the empty boxes.

[6]

2 A group of A-level students are working together to program a computer game.

In the game, the player controls a character who moves through a virtual world. The game starts with a load-up screen. The player can select which area to move to on an on-screen map, and then they control the movements of their character using a keyboard to solve puzzles on the screen.

(b) The game is to be created using sub-procedures. The following table identifies and describes one sub-procedure the students could use.

Complete the table below, identifying **three** additional sub-procedures that the students could create from the description at the start of question **2**.

Describe the purpose of each sub-procedure you have identified.

	Sub-procedure	**Purpose**
e.g.	`characterMovement`	*Takes the key the player pressed and moves the character in that direction*
1		
2		
3		

[6]

If you found this useful, drop a follow to help me out!

THANK YOU!

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